Vermeer Science Center
Solar Public Demonstration Project
"Showcasing Photovoltaic Energy for the Future"

This demonstration project will feature renewable energy generated from photovoltaic technology. The project team is excited about the challenges and opportunities this project brings to Central College; to educate our students and the general public about the methods in which renewable energy can be used to minimize our dependence on conventional fossil fuels. This demonstration will increase public awareness of the potential for photovoltaic solar energy.

Technical aspects of the project

In 1999, Alliant Energy donated two 4-kW photovoltaic arrays and associated grid-tied inverters to Central College. One of the arrays is currently being used at Central's Carlson-Kuyper Fieldstation to provide energy to that facility. The remaining array was installed on the roof of Central's Vermeer Science Center, currently in the final phases of a $20 million renovation and expansion.

The 4-kW array will be used to harness solar energy to power a fountain located outside the building's main entrance from campus. The fountain's sump, pumps, electrical gear, and brominating / filtering equipment will be located in a mechanical room directly under the fountain which is accessed from within the building. The array will provide up to 330 VDC to the pump room where it will be inverted to a variable frequency,

208 volt / 3 phase power source by incorporating an Aeroenvironment USPC 5000 controller. This speed controller will ramp the "solar pump" based on energy generated from the photovoltaic array. This standard 3 HP pump will be fully loaded when solar income is greatest, allowing 7 fountain jets, originating close to the building, to gradually change the flow characteristics of these arcing sprays in both height and length. These "arcing tubes of water" will be directed toward a bench located at the base of a sloping granite paver surface, allowing users to cool their feet if desired.

A sheeting action of water crossing the granite paver surface will originate from beneath a shelf located under the solar powered fountain jets. This flow will be maintained at all times the fountain is operated, (determined by the building's occupancy schedule and outdoor air temperature), by incorporating a 10 HP, 208 volt / 3 phase pump, which will sheet 650 GPM. This pump will be powered from the building's utility power supply.

Transferring the project results to appropriate audiences.

An informational plaque will be placed near the fountain, providing information in regard to how solar energy is being incorporated to power the fountain, and inviting visitors to learn more by accessing the electronic kiosk located in the building's main lobby, just a few steps away. This kiosk will feature a touchscreen monitor mounted flush with the wall facing the building entrance, which overlooks the solar-powered fountain. The monitor will display an eye-catching message that will invite the observer to touch the screen. Touching the screen will bring up a menu from which the guest may choose to learn more about the Vermeer Science Center, including the solar-powered fountain, a building directory, current weather information, renewable energy statistics and graphs, plus and a narrative in regard to building's LEED (Leadership in Energy and Environmental Design) medal rating. The College has registered the Vermeer Science Center with the U.S. Green Building Council in hopes of becoming the first LEED certified building in the State of Iowa, obtaining a silver (possibly gold) medal rating.

The weather and renewable energy information will include graphics that interpret data collected in real time from the
sensors mounted on the photovoltaic panels, such as AC solar power (watts), sunlight (lumens), wind speed (mph) and temperature. The display will also show energy saved, and the carbon dioxide, sulfur dioxide, and nitrous oxide being kept from the atmosphere due to the use of renewable energy vs. the burning of fossil fuels. The user will be able to view a brief explanation of why each of these items is significant, along with a general overview of photovoltaics and a description of this particular PV system's design.

The information displayed on the kiosk monitor will be programmed and implemented using state-of-the-art web technology, and the resulting information will be able to be accessed by anyone on the Internet.

Objectives

1. To provide a hands-on, interactive public demonstration of renewable energy for our students and general public.
2. To educate people on the potential of photovoltaics and the viability of this type of energy as a future energy source.
3. To provide our students (chemistry, physics, environmental science, and pre-engineering) with opportunities to work with renewable energy, possibly incorporating electrolyzers and fuel cells in the future to conduct research projects utilizing these resources; and to present their findings on this new technology to others throughout the state.
4. To align with the College's strategic plan of actively pursuing the goal: "To promote and model appreciation of our natural environment and stewardship of its limited resources."

Plan of Work and Project Schedule

- Summer 2001 — Begin discussions with architects and consultants regarding fountain powered by solar energy
- Fall 2001 — Contact vendors, consultants, contractors, and possible partners in this project
- Winter 2001/2 — Continue discussions with designers, general contractor, and partners, working through technical details, issuing construction documents, bidding and scheduling the mechanical/electrical scopes of work.
- September 2002 — Begin construction on the fountain at the start of phase II of the project.
- April/May 2003 — Install PV array and associated peripheral equipment, granite surfaces, shelves, and benches.
- June/July 2003 — Program and install electronic kiosk / commission all fountain equipment.
- Sept. 5, 2003 — Building dedication

Once complete, information about Central's renewable energy demonstration project will be publicized throughout the state. Faculty, students, and staff members will discuss the project during scientific meetings and conferences, including the Iowa Academy of Science. Prospective students, their families, and general public will tour the site and see solar energy at work in a practical application.

Central will also investigate the opportunity to host the I-RENEW energy fair once the project is up and running. We have conference facilities available as well as several green buildings and photovoltaic projects that could be featured.

The Pella Chamber of Commerce has agreed to publicize this project to all groups coming to tour Pella. In addition, the College's conference center and Vermeer Science Center is host to numerous business meetings and events throughout the year – the project will be publicized to these individuals.

Project personnel

Project director: Mike Lubberden, Director of Construction and Energy Management, Central College.

Information technology director: Deb Bruxvoort, Director of Academic Computing, Central College

Project construction engineer: Steve Heyne, The Weitz Company

Project architect: Jan Behounek, Holabird & Root

Collaborating organizations and/or consultants

Alliant Energy provided Central College with the photovoltaic array.

Holabird & Root LLP of Chicago was retained as the architect for the Vermeer Science Center renovation with James Baird acting as principle and lead designer. Within this organization Brian Stich, P.E. is serving as the project's lead electrical engineer and Lee Tapper, P.E. as the mechanical.

The Weitz Company of Des Moines is the Vermeer Science Center's general contractor and construction manager, with Chris Harrison acting as project manager.

Schott Applied Power is serving as the photovoltaic consultant, designing and commissioning the array and its peripheral equipment. They are partnering with Holabird & Root and Fountain Technologies, a Chicago-based fountain design firm.

Johnson Controls is serving as the building automation control contractor, and involved in the installation of the PV current sensing / weather station hardware, as well as importing the accumulated data to the kiosk.

Quality Attributes Inc. of Ames has been retained for the kiosk programming.

Kiosk Estimated Cost

Elo 18" Touch Monitor	$	1,700
Computer	$	950
Programming	$	9,800
Sensors, data collection	$	2,960
Installation	$	500
Plaque by fountain	$	300
Total	$	16,210